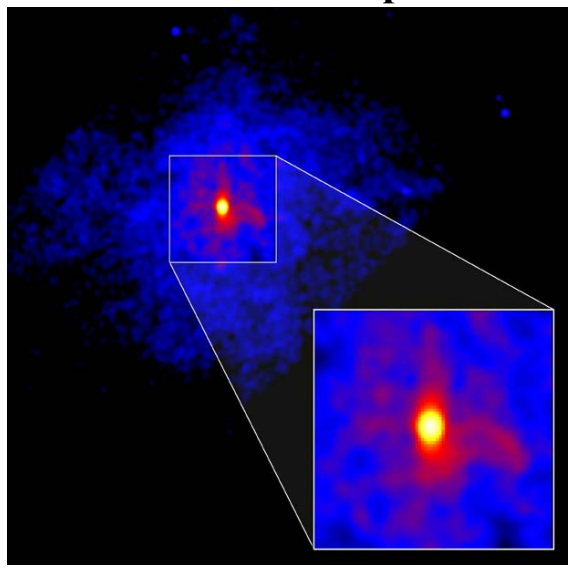
Chandra Science Highlights

RXJ1856 & 3C58

RXJ1856.5-3754 (left) A compact star about 400 light years from Earth
3C58 (right): A supernova remnant with a central pulsar about 10,000 light years from Earth



Chandra X-ray Observatory ACIS Image.

Chandra observations of RXJ1856.5-3754 and the pulsar in 3C58 suggest that the matter in these collapsed stars is even denser than nuclear matter, the most dense matter found on Earth. This raises the possibility that these stars are composed of free quarks or crystals of sub-nuclear particles, rather than neutrons.

[Credit: RXJ1856.5-3754 (NASA/SAO/CXC/J.Drake et al.); Chandra LETG/HRC image 3C58 (NASA/SAO/CXC/P. Slane et al).]

Reference: J.J. Drake et al. astro-ph/0204159; P. Slane et al. astro-ph/0204151

- Chandra observations of the spectrum of RX J1856.5-3754 showed a featureless spectrum consistent with a black-body radiating at T=700,000 K.
- For the known distance of 110 parsec, the radius derived for RX J1856 is 4.53±0.78 km, a radius too small to reconcile with neutron star models.
- No pulsations are seen above a level of 2.7%, so a localized hot spot is unlikely.
- Taken at face value, the observations favor an object composed of up, down and strange quarks - a strange quark star.
- Observations of 3C58, the remnant of supernova noted on Earth in AD 1181, reveal that the pulsar in the center of the remnant has a temperature less than 1.1 MK, compared to 2 MK predicted by conventional models. This suggest that an exotic, denser state of matter might exist inside this collapsed star.